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Evaluating Impact of Sustainable Supply Chain on Organization Performance and Efficiency in National Iranian South Oil Company

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ABSTRACT

Nowadays, supply chains are highly vulnerable and prone to various risks due to geographical expansion and the complexity of communication networks. Sustainability in supply chains is increasingly seen as part of supply chain management. Sustainability has become a necessity, and every supply chain needs sustainability. However, the supply chain has a breadth and complexity of indicators. This paper aims to provide a model for evaluating the impact of the sustainable supply chain on organizational performance and efficiency in the National Iranian South Petroleum Company (NISOC). This study consists of two quantitative studies and a qualitative stage by designing several questions and using a mixed research method. The qualitative stage uses grounded theory methods following a systematic review of the literature on sustainable supply chain management and its adaptation to the local needs of the sustainable supply chain in one of the country's largest oil companies. The statistical population of the research includes all employees of the NISOC with an unlimited number, of which 384 subjects are randomly selected as samples. In this study, a questionnaire is used as the data collection tool. The questionnaire designed in this research is based on a 5-point Likert scale. Options range from strongly agree to disagree strongly. The research hypotheses are tested using SmartPLS software. According to the results, the organizational performance and efficiency in the NISOC are affected by the green supply chain, industry supply chain, macro policies, socioeconomic factors, organizational factors, political factors, technology, manufactured products, customers, and supply chain failures. As shown in this study, using sustainable approaches to the supply chain of the petroleum company improves the situation of this organization and increases its effectiveness and efficiency. Further, the performance of individual components of organizations increases due to the sustainability model in this company.

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1. Introduction

The sustainable supply chain (SSC) is an issue that has drawn the attention of many researchers. In the current world of complexities, humans live in an age with the need for more advanced tools to understand an organization due to the increasing rate of change. Supply chains encompass organizations cooperating to meet the customers' needs (Koberg and Longoni, 2019, 1087). In today's economy, the actual competition no longer occurs between a company and another, but one supply chain competes with another. Consequently, proper management and performance of the SSC are recognized as crucial factors in achieving competitive advantages by companies more than ever (Khan et al., 2021, 278). The measurement of SSC performance is defined as the quantification process of the efficiency and effectiveness of processes. SSC performance measurements can be seen as the feedback received from the activities related to customer satisfaction, decisions, and strategic goals (Sabei et al., 2019, 2118). To emphasize the SSC performance assessment, Khan et al. (2021) identified the lack of a measurement system as the main reason for the poor performance of the SSC. Hence, developing a proper system designated to measure the SSC performance appears to be highly important due to its significant impact on the performance of supply chain management (SCM). Over the past 10 years, companies have concluded that they require effective strategies to increase the competitiveness of their supply chain. Thus, the traditional view of the supply chain changed to SSC management (SSCM) (Xiao et al., 2019: 4). The concept of sustainability was introduced during the 1970s and 1980s but was formally described and explained by the 27 Principles of Rio Declaration (1992) for the environment and development as described below:

1. The role of man: man is at the center of sustainable development.

2. State property rights: Of course, within the framework of the regulations of the whole country

3. The right to development

4. Paying attention to environmental protection in development processes

5. Poverty eradication

6. State cooperation for ecosystem protection

7. Priority for the underdeveloped

8. Reducing unsustainable production and consumption patterns

9. Creating capacity for sustainable development

10. Public participation

11. National environmental laws

12. An open and supportive international economic system

13. Compensation for victims of pollution and other environmental damages

14. State cooperation to prevent cunning environmental competition

15. Preventive principles

16. Internalization of environmental costs

17. Evaluation of environmental effects

18. Warning about environmental disasters

19. Timely and prior warnings

20. Women play a vital role.

21. Youth mobilization

22. Indigenous people play a vital role.

23. People under oppression: They must be protected.

24. War: Environmental laws must be respected in times of conflict.

25. Protection of the environment, development, and peace

26. Resolving environmental disputes

27. Cooperation between the government and the people (Bui et al., 2021, 380).

A literature review reveals that the definition of the word sustainability can change from the state of an intra-organizational philosophy to a multidimensional word, with the former focusing on ensuring that future generations are not negatively affected by our current activities. The focus of a multidimensional word encompasses topics related to the triple bottom line (TPL). This mode focuses on balancing different social, environmental, and economic dimensions that are the same as those of the SSC (Esmaeilian et al., 2020, 21). Experimental and theoretical studies in the area of the supply chain have demonstrated that supply chains are inherently risk-tolerant and disruptions within the supply chain are inevitable. Available reports on evaluating the flexibility of supply chains based on the survey of 75% of respondents in 71 countries have indicated that there is at least one severe and significant disruption within any supply chain (Glendon and Bird, 2013), while 15% of reports on supply chain disruptions have shown a loss rate of more than one million pounds. SCM is a complex process with many risk factors involved in all its activities, which are managerially considered a threat to performing typical activities; in particular, the supply chain risks are unforeseen events (Hu et al., 2019, 181). Identified corporate risks, policy failures, failures of critical customers, technology risks, and market risks are some supply chain risks. By reviewing 519 articles between 1995 and December 31, 2019, Govindan et al. (2019, 789) demonstrated that the reduced supply chain activity across commercial activities (due to sourcing, production, and product delivery) was associated with SCM. The theory of systems is a comprehensive approach to understanding a phenomenon that can be used for several disciplines and fields (Mele et al., 2010). Although an organization may appear monopolistic and independent, it is part of a larger whole, the community, and the interaction between them. Failure in its understanding accurately may lead to the destruction of the organization. The theory of systems is highly relevant to the study since its understanding is a theory focusing on interaction (Mele et al., 2010). It brings meaning to the complicated relationship between an event outside the management control in the external environment and an organization, that is, how these events can affect suppliers/customers and cause disruptions in the efficiency of the company and its customers. Understanding the theory of systems will help prepare to identify events with such potential effects and manage their impacts (Mardani et al., 2020, 120). Concerns about organizational efficiency originate from the first scientific methods in management. The measurement and improvement of efficiency have always been at the core of management goals since an organization will face losses without efficiency. Efficiency is a critical issue as it increases the competitiveness of any business. Furthermore, it is a rich combination of efficiency and effectiveness (Gardas et al., 2019, 245) that organizational goals cannot be realized without in manufacturing firms (Zimon et al., 2020, 21).

The concept of performance is a term usually used by management and industry professionals. This has led many researchers to classify organizational performance with efficiency, profitability, and customer satisfaction. Grong et al. (2019) presented evidence that poor organizational performance measurement would lead to a weak competitive position and an unsustainable competitive advantage. However, the findings of Gu and Jung (2013) were confirmed by Guo et al. (2019, 3699), who demonstrated growth, efficiency, and profitability as the commonest measures of SME performance in the literature. Many researchers have frequently studied SSC performance. In the past, the SSC performance was mainly evaluated based on cost/efficiency, profit orientation, and short-term periods with distinct and individual indicators. However, newer approaches have been proposed with the intensification of competition, such as value orientation, customer orientation, long-term periods, and group benchmarks for performance evaluation. Accordingly, choosing an appropriate approach to evaluating the SSC performance appears vital. Nowadays, companies must deal with multiple new challenges, including identifying the problems related to climate change, facing the adverse effects of financial crises and prices, addressing public ecological interests such as green logistics and green design, and ensuring environmental sustainability and the sufficiency of energies.

Moreover, additional pressures are imposed on companies through the enactment of environmental laws (including EU environmental laws), mass media, the public opinion of society in general, international sanctions, and the growing and significant demand of customers for transparency and their increased awareness about the conditions of manufacturing and distribution of goods, including environmental, safety, and human rights issues. These circumstances have created the concept of sustainability. The concept of the supply chain has been broadened with the addition of sustainability, which refers to the combination of three social, environmental, and economic issues (Jia et al., 2018, 270).

Since the eruption of the first oil well in Masjed Soleiman on May 26, 1908, the oil-rich areas of the south, as the birthplace of Iran's petroleum industry, have been known as the leading producer of Iran's crude oil. Before the Islamic Revolution, the oil-rich regions were managed by two particular companies of Iranian petroleum services: the Oil Service Company of Iran (OSCO) and the Nonindustrial Service Company. After the revolution and the beginning of the imposed war, the Oil-rich Areas Management Company has renamed the Onshore Areas Production Management Company, and its scope of activity covered the whole country. Finally, the organizational structure of the southern oil-rich regions was formed in 2000 as a central headquarters and nine subsidiary companies according to the policies and plans of the Ministry of Petroleum aiming at making changes in the management of activities. The headquarter of The National Iranian South Oil Company (NISOC) comprises seven departments of production management, technical affairs, financial affairs, engineering and construction, human resources, integrated planning, and logistics and commodity affairs. The company has five affiliated petroleum and gas exploitation companies, including Karun, Marun, Aghajari, Gachsaran, and Masjed Soleiman, which are named and operated based on their geographical locations and the main fields under their control. One can conclude that the issue of the SSC needs to be seriously considered for the survival of the crude petroleum and petroleum products export industry for the NISOC. With such a situation, those organizations will win in the competition stage that can make optimal decisions throughout the chain, try to reduce the cost price, and increase the quality of their export products while establishing a proper relationship between elements of the entire SSC. Measuring the SSC performance is one of the significant issues discussed concerning the SSC. The absence of a measurement system appears to be one of the crucial reasons for the poor performance of the SSC. Different models have been provided to measure SSC performance, and many studies have tried to adapt performance evaluation metrics in different industries (Hussain and Malik, 2020, 138).

It should be noted that the three parts of the supply chain (suppliers/core/customer) include the following.

Suppliers: the list of manufacturers and nondomestic and foreign manufacturers of petroleum industry resources.

Procurement units: the management, deputies, and all subordinate departments of procurement management and goods affairs.

Customer: The headquarters of the southern oilfields, managements, affiliated organizations, and five petroleum and gas exploitation companies (Kot, 2018, 5).

Since the National Company of Southern Oilfields has the following characteristics, it was selected as a case study:

1. Ability to share the results of research with other similar companies in the field of the Ministry of Petroleum and the National Iranian Oil Company

2. Completeness of supply chain due to its process

3. Appropriate age and organizational structure (

4. Existence of experienced staff and related education to select a group of experts

5. Ease of obtaining information and more accessibility to the relevant authorities

6. Most importantly, this company is the largest company in the country in terms of revenue generation at the national level and one of the largest companies in the region, producing more than 80% of Iran's petroleum and 20% of Iran's gas (Saeed et al., 2019, 14).

Another critical issue is finding out the factors that can empower the SSC to improve performance and sustainability in this industry. The factors contributing to the better performance of the SSC are called SSC enablers, which are mentioned in various studies. Identifying the effect of SSC enablers on chain performance and stability can significantly help make the right decisions for the chain management. To this end, this article focuses on evaluating the impact of the SSC on organizational performance and efficiency in the NISOC. An overview of the research literature and hypotheses is presented in the following. The research design and data collection are discussed in the next section. Then, the research findings are interpreted, followed by a conclusion.

2. Literature review

Before delving into the main keywords of this study, sustainable development is defined as follows.

Sustainable development is a process that envisions a promising future for human societies in which living conditions and the use of resources meet human needs without compromising the integrity, beauty, and stability of vital systems. Sustainable development provides solutions to the structural, social, and economic patterns of development to address issues such as the destruction of natural resources, the destruction of biological systems, pollution, climate change, population growth, injustice, and the declining quality of life of present and future humans (Mirfakhreddini et al., 2019, 14). Sustainable development is a process adapted to current and future needs in the use of resources, investment guidance, technology development orientation, and institutional change. Sustainable development, which has been emphasized since the 1990s, is an aspect of human development related to the environment and future generations. The goal of human development is to cultivate human capabilities. Sustainable development as a process, while necessary for improvement and progress, provides the basis for improving the situation and eliminating the social and cultural shortcomings of advanced societies and should be the driving force for the balanced, economically proportionate and coordinated, social, and cultural development of all societies, especially countries (Mohammadi et al., 2018, 41). Sustainable development seeks to address the following five basic needs: integrating conservation and development, meeting basic human biological needs, achieving social justice, autonomy, and cultural diversity, and protecting ecological unity. Hence, the focus of sustainable development is much broader than just the environment. It is also about ensuring a robust, healthy, and just society, indicating meeting the diverse needs of all individuals in present and future societies, promoting personal well-being, social cohesion, and inclusion and creating equal opportunities (Tseng et al., 2019, 768).

In today's world, logistics managers face a significant challenge in evaluating the performance of their logistics processes. Benchmarking the best foreign or domestic competitors in one industry can be used to determine this benchmark standard (Mohammadi et al., 2018, 41). The efficient and ideal performance of an organization's logistics system can play an influential role in the organization's excellence and desire to meet management goals, especially profitability. To this end, implementing a system for measuring logistics engineering performance with the Kaizen approach and lean-agile logistics can systematically improve logistics processes (Paliwal et al., 2020, 50).

The supply chain is, firstly, the processes that connect the customer to suppliers from the beginning of raw materials to the end of the final consumption of the finished product, and secondly, the set of tasks inside and outside the organization that create the value chain to create products and services to customers (Rebs et al., 2019, 1270).

Sustainability emerged in the 1970s and early 1980s but was generally defined in general terms in the 1987 report of the World Commission on Environment and Development. That definition is a development that satisfies the needs of the current generation without limiting the ability of future generations to develop their needs.

A sustainable supply chain is a supply chain that considers the three dimensions of sustainability: economic, environmental, and social (Luthra et al., 2018, 199).

Sustainable supply chain management includes the management of all activities related to the process of exchange of goods and services from the stage of supply of raw materials by suppliers to the stage of the final product that the customer can consume. Today, a broader definition is provided by the global supply chain association: supply chain management is the integration of key business processes from the end user to the leading supplier that provides products, services, and information that add value to the organization for customers and stakeholders. The management of supply chains, while considering all three dimensions of sustainability, namely economic, environmental, and social, develops the traditional concept of supply chain management by adding environmental and social/ethical features (Zimon et al., 2019, 72).

Organizational performance: Most marketing researchers believe that subjective performance metrics such as customer satisfaction, customer loyalty, and quality are essential and influential factors in objective performance metrics such as the profit margin and the rate of return. Many marketing activities directly affect customer performance, such as satisfaction and loyalty, and customer and market performance affect the company's financial performance. Accordingly, business performance consists of three components: market performance, customer performance, and financial performance. Customer performance emphasizes customer loyalty and satisfaction; market performance emphasizes sales volume, sales growth, and market share, and financial performance emphasizes profit, profit margin, return on investment and return on sales. Marketing researchers have used the above criteria repeatedly. Numerous studies also show its validity and reliability. This study uses indicators such as sales growth and increasing market share to measure business performance (Geong et al., 2019, 91).

Efficiency is the ratio of an organization's outputs to inputs. Outputs are items and achievements that the organization's performance is expected to achieve. Inputs are items that an organization uses to achieve outputs (Panigrahi and Bahinipati, 2018).

The National Company of Southern Oilfields: Since June 25, 1287, with the fountain of the first well in Masjed Soleiman, the oil-rich regions of the south, as the birthplace of Iran's petroleum industry, were the leading producer of crude petroleum in the country. The organizational structure of the southern oil-rich regions consists of a central headquarters rather than a subsidiary. The National Company of Southern Oilfields headquarters has seven managements: production, technical affairs, finance, engineering and construction, human resources, integrated planning, and procurement and commodity. The company has five petroleum and gas exploitation companies, including Karun, Maroon, Aghajari, Gachsaran, and Masjed Soleiman (Silvestre et al., 2018, 770).

However, this export has been dramatically reduced with the imposition of sanctions. With more than 45 large and small hydrocarbon fields in more than 400,000 square kilometers from Bushehr province to northern Khuzestan, the company produces about 80% of the country's crude petroleum and 16% of its gas (Jia et al., 2019, 49).

A sustainable supply chain is the consideration of social and environmental issues in all organizational processes. These processes include the entire life cycle of the supply chain, from purchasing raw materials to product design and development, and the warehousing, distribution, and delivery of the final product. Supply-chain sustainability is a business issue that affects the organization's supply chain and organizational logistics network based on environmental factors and production waste management (Sajjad et al., 2020, 599). There has been significant growth in the need to integrate environmental activities with the organization's supply chain management. The supply chain sustainability approach is a new operations management approach in recent years.

SCM is a fusion of science and art defined in various forms in the literature. Some of the most important and valid definitions relevant scholars provide are as follows.

SCM is the set of measures to integrate service and commodity providers, manufacturers, warehouses, and vendors to produce the optimal amount of goods and sends optimal values to appropriate places at the right time. By doing this set of operations, it tries to minimize costs while achieving customer satisfaction (Dahlmann et al., 2019, 1638).

In a managed supply chain, the manufacturer and its suppliers, buyers, and customers, i.e., all members of an expanded organization, work together to present a common product or service to the market for which the customers are willing to pay. These partner companies operate as an expanded organization and optimally use the shared resources to achieve a unique competitive advantage. As a result, they will achieve a high-quality product or service with easy accessibility and low cost (Hu et al., 2019, 179).

SCM encompasses the integration of business processes from the end-user to the primary suppliers, providing a product, service, or information that creates customer value (Jia et al., 2019, 48).

SSCM aims to integrate environmental thinking into SCM. This process involves the product design, preparation and selection of materials, production process, delivery of the final product to consumers, and the management of the final product life cycle. Organizations operating in today's business environment are aware of the fact that the ability and capacity of the supply chain are the core components for success in competition in the global market economy (Ahmed et al., 2018, 810).

Moktadir et al. (2018, 640) analyzed case studies (10 supply chains from 10 different organizations) to find out what has been done in this area by more sustainable companies. Their findings suggest that organizational actions leading to more SSCs are a combination of the best practices in traditional SCM and new active behaviors toward sustainable practices that can only be effective in the case of a dynamic interaction between dimensions. Therefore, changes in one parameter can influence other parameters and may ultimately affect the system. The critical challenges of sustainability in the context of SCM emerge in the relationship between the three dimensions. However, research on the environmental dimension has been more prominent than on the social dimension until recently, and even less attention has been paid to the relationships between dimensions. The effects of products on the environment are analyzed using a holistic approach (including the analysis of the product life cycle from its start to the end) to evaluate the environmental effects of supply chain activities. In this approach, all ecological effects (the science of habit, the way of life of creatures, and their interactions with the environment) of each activity at different stages of the product life cycle, such as the product concept, design, preparation of raw materials, manufacturing and production, assembly, maintenance, packaging, transportation, and the reuse of the product, are measured and considered in the product design. Although the concepts of SSCM and green supply chain management (GSCM) are often used interchangeably in the supply chain literature, these two concepts are slightly different. SSCM encompasses sustainable economic, social, and environmental dimensions. Therefore, its concept is broader than GSCM, which is part of SSCM (Xiao et al., 2019, 15).

SCM is suggested to consider environmental protection and expand the concept of sustainability in production and consumption activities. As such, companies seeking economic efficiency should not overlook the social benefits, and companies have to pay attention to social responsibility to achieve the sustainable development processes of product manufacturing. Government, businesses, and scholars are highly concerned about sustainable development. Currently, companies are seeking to recognize the importance of SSCM (Saur and Seuring, 2018, 12).

An SSC can reduce environmental pollution and production costs, improve economic growth, create a competitive advantage in terms of greater customer satisfaction, and provide a positive image and the reputation of the firm, as well as a better opportunity to export our products to environmentally friendly countries. Sustainable ideas contain novel innovations and techniques to protect environmental sustainability. By relying on the social responsibility of companies, sustainable production, waste reduction, recycling, and rebuilding an eco-friendly/environmentally friendly supply chain can be developed in the supply chain. In today's world, firms encounter intense pressures from various stakeholders, including the government and customers, to reduce their harmful effects on the environment as a result of enhanced environmental awareness (Li et al., 2019, 299). Over the past few decades, the increasing impacts of global warming, climate change, waste production, and air pollution have dramatically drawn the global attention of experts to the issue of SSC, leading them to an optimal solution to be sustainable. SSCM plays a crucial role in motivating organizational sustainability. As environmental concerns are constantly rising, SSCM has become an ongoing concern of society, especially in developed countries. The importance and benefits of SSCM seem to be beyond preventing the use of toxic chemicals or reducing the emission of pollutants into the environment. The principles of SSCM can be applied to all parts of an organization and may serve effectively in all tangible and intangible fields (Roy et al., 2018, 56).

Moreover, several factors have served as tools for the organizational supply chain with far more impact, such as increased environmental awareness among the masses, competition and environmental images, strict legal policies, and government pressures (Vargas et al., 2018, 241).

The communication and coordination between members can improve the overall performance of the supply chain in line with improving the performance of the SSC. The general coordination of people involved in the supply chain should be in such a way that eventually improves the company's overall performance. According to (Das, 2018, 191), the evaluation of a lean supply chain performance includes the internal performance evaluation index, external performance evaluation index, and the evaluation index of comprehensive supply chain performance. Shokouhyar et al. (2020) believed that the original idea of SSCM involved using integrated management in the SSC process. Fang et al. (2013) assessed the performance of an SSC based on uncertainty. In a study by Mehdikhani and Valmohammadi (2019, 89), an experimental analysis using the comprehensive evaluation method revealed that implementing a lean SSC could improve internal performance, external performance, and the overall supply chain performance; in addition, the development trend of external performance and internal performance followed a sustainable state (Narimissa et al., 2020, 120).

However, a consistent focus on the supply chain is associated with its specific complexities in business-related activities, such as different risks and risk factors. A high frequency of risks in an SSC can disrupt its performance. Given the process of finding sustainable resources and its operations, it seems crucial to pinpoint the provision/purchase of products and services with the minimum impact on natural resources and the environment in society. Therefore, the risk in an SSC can significantly affect the right sustainable organizational decisions regarding disruption in the material supply process, quality-related issues, increasing negative environmental impacts, reducing performance, and events regarding trade losses (Fathi et al., 2020, 630).

Arabsheybani and Arshadi Khasmeh (2021, 200) identified some of the SSC-related risks in corporate risks, policy failure, key customers' failures, technology risks, and market risks. By reviewing 519 articles between 1995 and December 31, 2010, Maine and Kim (2012) demonstrated that the reduced supply chain activity throughout business activities (due to sourcing, production, and product delivery) was associated with SCM. The enactment of a series of laws and various pressures have affected the process of sustainable implementation in the supply chain dimension, as reported in the majority of published articles with a focus on the success factors in the supply chain. However, the activities of an SSC involve various risks and risk factors that can disrupt the SSC and reduce its performance. Some models are proposed in sustainability studies with some differences and similarities. As the introduction of the dimensions of sustainability is still ambiguous in the literature, this dissertation seeks to introduce and outline the sustainability models to identify the main dimensions of sustainability (Rebs et al., 2019, 1269).

On the other hand, there is no perfect and comprehensive system to measure sustainability, and some shortcomings can be found in each of the available measurement methods. Hence, another goal of this study is to provide a proper measurement method. The models proposed in the context of sustainability and individual enablers and sustainability measurement indices may vary from one industry to another, from large companies to small ones, and from one region to another.

In this regard, Zahraee et al. (2018, 229) evaluated the impact of two green and sustainable supply chains under competition and cooperation on the product sustainability level. When suppliers and manufacturers compete or cooperate in a reverse supply chain (RSC), the sustainability, demand, and profit levels are analyzed under the considered structure. According to the results, although cooperation does not always lead to a balance, the results appear as an optimal solution in the case of a low degree of competition. Rabbani et al. (2018, 831) acknowledged that the design of an SSC network had dramatically drawn attention in industrial and academic environments in recent decades. The increasing and influential importance of sustainability in the supply chains of various industries and the growing regulations for managing carbon and waste make factories consider environmental and social goals alongside economic goals in their supply chains. This paper, therefore, focuses on designing an SSC network for the low-alcohol beer industry to fill the research gap in the literature on the SSCM of this industry, along with the specific relevant operational process.

Moreover, a mathematical planning model is proposed simultaneously by considering the economic, social, and environmental dimensions of sustainability. A weighting-based method is used to solve the proposed multi-objective model. The optimal supply chain network policy is determined using a numerical example by expressing some assumptions in the proposed general model. Due to population growth and increasing waste, the RSC and reverse logistics have acquired a special place in the academic and industrial environments (Hasan, 2018, 190).

Moreover, the increased public awareness and wasting underground resources seem to be the other causes that have led manufacturing companies and academic researchers toward the RSC. On the other hand, waste management has long been associated with serious problems for different countries and heavy consequences for human beings and the environment. As one of the most essential and serious dilemmas for the environment and society, tire waste has become one of the critical challenges in the world due to its increasing volume. An integer linear mathematical model has been developed in an article for designing a tire RSC network by considering sustainability goals such as economic, social, and environmental costs. In this RSC, optimal sites, allocating the number of worn tires to each established site, and the maximum number of recycling and coating worn tires are determined appropriately to set the sustainability goals at their ideal state. The efficiency and practicality of the model are finally demonstrated by implementing the proposed model in the French tire industry and analyzing the results. An SSC takes into account material flow management (MFM), information, capital flows, and cooperation between companies throughout the supply chain, together with the integration of goals from all three dimensions of sustainable development (economic, environmental, and social goals), which are derived from the needs of customers and stakeholders. In SSCs, the members apply social and environmental criteria to survive throughout the supply chain; simultaneously, competitiveness is expected to be maintained by meeting customer needs and relevant economic measures. SSCM implements corporate accountability practices to realize higher efficiency in logistics performance and resource utilization by taking into account the three dimensions of sustainability, i.e., economic, social, and environmental goals. Organizations move toward sustainability in the supply chain and set new standards. This research presents the following tested paradigm model based on Aghajani et al. (2018, 130).

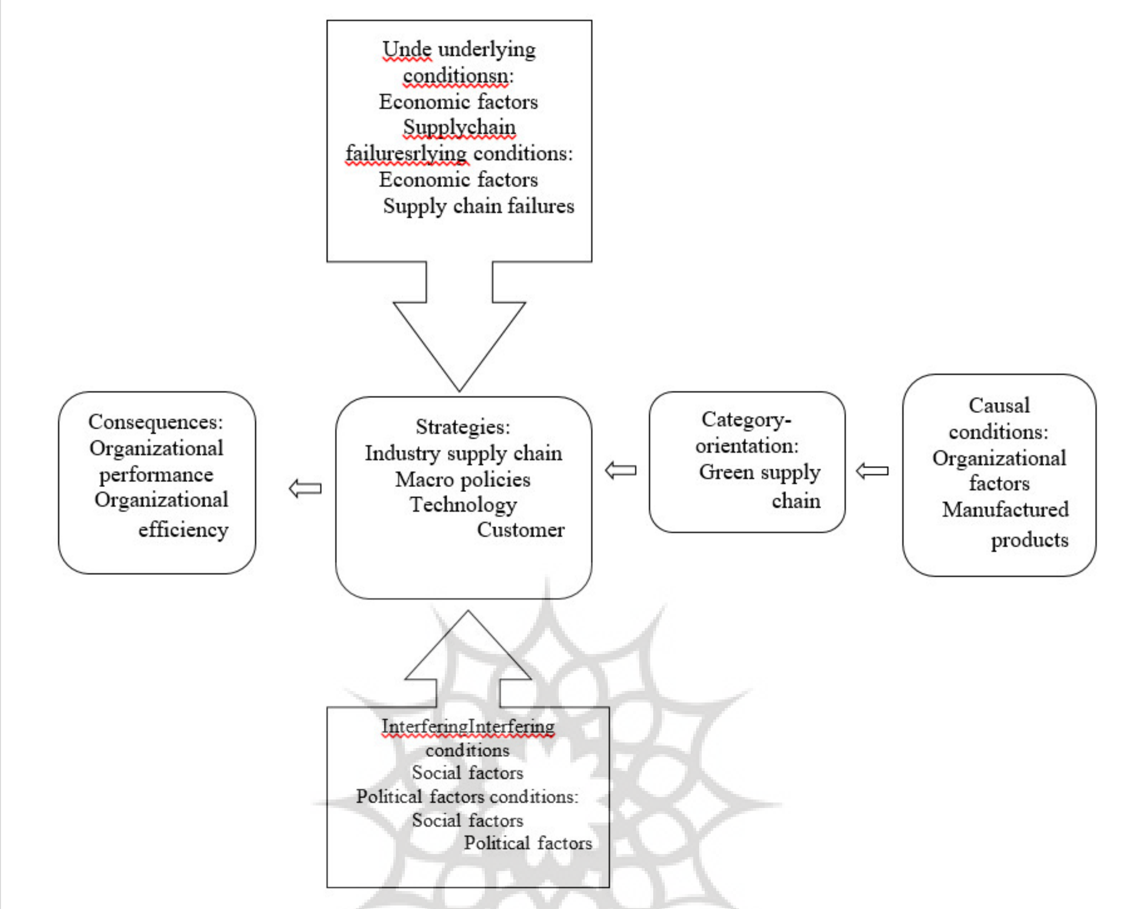

Figure 1: The paradigm model of an SSC and its impact on organizational performance and efficiency in the National Iranian South Oil Company.

According to what has been discussed so far, supply chain management has three main processes as follows:

Information management: Today, the role and position of information are evident to everyone. Proper circulation and proper transfer of information make processes more efficient and effective and easier to manage. In the supply chain, the issue of coordination in activities is crucial. Coordinated and appropriate information management between partners will increasingly impact decisions, speed, accuracy, quality, and other aspects (Ebrahim et al., 2017, 131).

Logistics management: This section includes all physical activities from the preparation stage of raw materials to the final product, including transportation, warehousing, and production scheduling.

Relationship Management: This is one of the most critical issues in the supply chain and has a profound impact on all areas of the supply chain and its level of performance. Many initial failures in the supply chain are due to poor transmission of expectations and the result of behaviors between the parties involved. In the development of any integrated supply chain, the development of trust and confidence among partners and the design of reliability for them is a critical and essential element for success (Stranieri et al., 2019, 485)

Some of the benefits of using a sustainable supply chain include increasing efficiency, improving productivity, creating new markets, reducing costs, reducing pollutants, improving the public image of the organization, and increasing the commitment and social responsibility of the organization. Optimizing energy consumption, reducing waste, reducing costs, conserving natural resources, improving the quality of life, and creating and maintaining a better environment for future generations are the main obstacles to achieving sustainable supply chain management (Heidari et al., 2018, 6).

For effective supply chain management, suppliers and customers must work together in a coordinated manner through partnerships, information communications, and dialogue. This means a rapid flow of information among customers, suppliers, distribution centers, and transportation systems, enabling some companies to create highly efficient supply chains. Suppliers and customers must have the same goals and must trust each other. Customers trust their suppliers in the quality of products and services (Fathi et al., 2019, 632).

In addition, suppliers and customers must participate in supply chain design to achieve common goals and facilitate communication and information flow. Some companies try to gain control of their supply chain through general vertical control using the ownership and integration of all the components along the supply chain, from the supply of materials and services to the delivery of the final product and customer service. Nevertheless, even with this type of organizational structure, different activities and operational units may be incoherent. The company's organizational structure should focus on coordinating different activities to achieve the overall goals of the company (Faryabi et. 2019, 26).

Consequently, the following items are the innovations of this study:

1. Presenting a local and operational model for a sustainable supply chain with emphasis on the supply chains of Iran's petroleum and gas industry has been considered for the first time.

2. Relying on multidimensional and layered models focusing on three dimensions of economic, environmental, and social sustainability

3. Sustainable supply chain management is currently a new topic and research gap; this gap will be repaired by doing this research. Sustainability assessment focusing on all dimensions of sustainability and presenting new indicators by petroleum experts has led to the development of literature (Mirghafouri et al., 2018, 11).

4. Investigating and identifying the incentives and barriers of supply chains of Iran's petroleum and gas industry.

The time territory for collecting primary data is from the second half of 1399 to the end of 1400. This study was conducted at the National Iranian South Oil Company.

3. Methodology

In this study, both descriptive and inferential statistics were used to analyze the data. In the descriptive statistics section, the mean and standard deviation were the smallest and largest, and in the inferential statistics section, the first- and second-order confirmatory factor analysis was used with the help of Smart PLS3 software and the Friedman test with the help of SPSS 21 software. As the second generation of structural equation methods, the partial least squares approach has opened new horizons for behavioral and management science researchers. The reason for choosing this approach is that, unlike the covariance-based approach, it has less dependence on the sample size, the level of measurement of variables, and the normality of the distributed data. It can be said that partial least squares (PLS) require fewer conditions compared to techniques similar to structural equations such as LISREL and EMOS. The partial least squares approach is more suitable for real applications; especially when the models are more complex, it will be more desirable to use this approach. Of course, the main advantage of PLS is that it requires fewer samples than other approaches, such as LISREL and Emus. In other words, PLS has no sample size limit. This research uses PLS software to investigate measurement models through validity and reliability analysis and first and second-order confirmatory factor analysis. In general, the test criteria of the measurement model in the partial least squares approach are as follows.

A cross-sectional survey research design was used to collect the required data. The statistical study population consisted of all employees of the NISOC with an unlimited number to evaluate the relationships and validation of the model. With a total of 384 subjects, 394 people were considered as the sample to control the distorted, inappropriate, and missing data. Of 394 distributed questionnaires, 384 complete questionnaires were finally collected and analyzed after removing distorted data. The data collection tool was a questionnaire with 78 questions and 13 categories, including organizational efficiency, GSC, industry supply chain, macro policies, organizational performance, socioeconomic factors, organizational factors, political factors, technology, manufactured products, customer, and supply chain failures. The confirmatory factor analysis (CFA) was used to examine the data. Further, the model fit test and structural equation modeling were utilized to test the hypotheses described in the study. Data were analyzed using SmartPLS software.

Since a standard questionnaire was employed to measure the variables, the intended indices were first translated, and then relevant experts made necessary modifications. The strength of the relationship between the factor (latent variable) and the observable variable is indicated by the factor load, with a value ranging between zero and one. A factor load less than 0.3 indicates a weak relationship and is ignored. A factor load value between 0.3 and 0.6 is acceptable, and a value greater than 0.6 is highly desirable. As presented in Table 1, all factor loads of variables have a value greater than 0.5, which confirms the acceptable reliability of the measurement model.

Table 2: The factor loads and research variables

Direction	Factor load	Statist T	Direction	Factor load	Statist T
Q01 → Organizational efficiency	0.838	28.486	Q40 → Organizational factors	0.845	31.215
Q02 → Organizational efficiency	0.829	20.141	Q41 → Organizational factors	0.691	17.078
Q03 → Organizational efficiency	0.749	17.517	Q42 → Organizational factors	0.754	21.851
Q04 → Green supply chain	0.91	72.624	Q43 → Organizational factors	0.759	20.134
Q05 → Green supply chain	0.903	72.136	Q44 → Organizational factors	0.813	24.134
Q06 → Industry supply chain	0.724	16.113	Q45 → Organizational factors	0.756	14.179
Q07 → Industry supply chain	0.747	20.714	Q46 → Organizational factors	0.676	14.481
Q08 → Industry supply chain	0.838	27.252	Q47 → Organizational factors	0.645	10.894
Q09 → Industry supply chain	0.756	19.633	Q48 → Organizational factors	0.628	11.789
Q10 → Industry supply chain	0.665	15.518	Q49 → Organizational factors	0.809	27.172
Q11 → Industry supply chain	0.739	16.343	Q50 → Organizational factors	0.609	11.592
Q12 → Industry supply chain	0.586	10.007	Q51 → Organizational factors	0.847	31.473
Q13 → Macro policies	0.65	13.932	Q52 → Political factors	0.915	51.372
Q14 → Macro policies	0.811	29.243	Q53 → Political factors	0.757	20.2
Q15 → Macro policies	0.683	18.256	Q54 → Political factors	0.913	43.587
Q16 → Macro policies	0.881	58.424	Q55 → Political factors	0.913	52.93
Q17 → Macro policies	0.727	15.065	Q56 → Technology	0.835	26.582
Q18 → Organizational performance	0.863	39.793	Q57 → Technology	0.814	22.915
Q19 → Organizational performance	0.728	16.698	Q58 → Technology	0.85	35.834
Q20 → Organizational performance	0.686	14.084	Q59 → Manufactured products	0.844	39.199
Q21 → Organizational performance	0.85	35.627	Q60 → Manufactured products	0.792	25.01
Q22 → Organizational performance	0.665	12.68	Q61 → Manufactured products	0.86	52.564
Q23 → Organizational performance	0.611	9.898	Q62 → Manufactured products	0.806	37.067
Q24 → Organizational performance	0.725	14.103	Q63 → Customer	0.772	20.961
Q25 → Organizational performance	0.72	15.768	Q64 → Customer	0.791	22.352
Q26 → Social factors	0.879	37.486	Q65 → Customer	0.788	20.081
Q27 → Social factors	0.709	14.422	Q66 → Customer	0.663	11.369
Q28 → Social factors	0.831	26.447	Q67 → Customer	0.657	10.08
Q29 → Economic factors	0.688	15.207	Q68 → Failures	0.679	15.626

Direction	Factor load	Statist T	Direction	Factor load	Statist T
Q30 → Economic factors	0.803	26.355	Q69 → Failures	0.854	40.377
Q31 → Economic factors	0.712	15.436	Q70 → Failures	0.813	34.989
Q32 → Economic factors	0.597	9.931	Q71 → Failures	0.803	29.512
Q33 → Economic factors	0.817	26.488	Q72 → Failures	0.75	17.434
Q34 → Economic factors	0.599	8.184	Q73 → Failures	0.786	26.696
Q35 → Economic factors	0.669	12.363	Q74 → Failures	0.69	16.978
Q36 → Economic factors	0.829	26.431	Q75 → Failures	0.807	25.472
Q37 → Economic factors	0.775	22.029	Q76 → Failures	0.758	23.342
Q38 → Organizational factors	0.558	8.98	Q77 → Failures	0.78	24.227
Q39 → Organizational factors	0.624	8.56	Q78 → Failures	0.775	20.596

Then, the reliability of the research variables was assessed by the indices of Cronbach's alpha with an expected value above 0.7 (Cronbach, 1951), composite reliability (CR) with an expected value above 0.7, and the average variance extracted (AVE) with a common value above 0.5 (Fornell and Locker, 1981) using Smart-PLS software. Table 3 indicates that the research variables have convergent reliability and validity.

The Cronbach's alpha values of all variables are higher than 0.7, which confirms the reliability of all variables. The convergent validity is confirmed as the AVE is always greater than 0.5. Divergent validity (the Fornell and Larker method) is also used.

In the divergent validity process, the difference rate between the indices of one construct and those of other constructs in the model is calculated by comparing the AVE square root of each construct with the correlation coefficients between the constructs. This requires the formation of a matrix in which the coefficients of the AVE square root of each construct are considered the values of the main diagonal of the matrix, while the lower and upper values of the main diagonal are the correlation coefficients between each construct and the other ones (see Table 4).

Table 3: The convergent reliability and validity of the research model variables

Variables	Cronbach's alpha	Composite Reliability (CR)	AVE
Organizational performance	0.876	0.903	0.541
Organizational efficiency	0.730	0.848	0.651
Economic factors	0.885	0.908	0.527
Social factors	0.733	0.850	0.656
Technology	0.780	0.872	0.694
Manufactured products	0.844	0.895	0.682
Customer	0.787	0.855	0.543
Failures	0.932	0.942	0.599
Organizational factors	0.927	0.937	0.520
Macro policies	0.807	0.867	0.570
Political factors	0.898	0.930	0.769
Industry supply chain	0.847	0.885	0.526
Green supply chain	0.873	0.902	0.822

Table 4: The matrix comparing the AVE root and correlation coefficients of the constructs

	Organizational performance	Organizational efficiency	Economic factors	Social factors	Technology	Manufactured products	Customer	Failures	Organizational factors	Macro policies	Political factors	Industry supply chain	Green supply chain
Organizational performance	0.735												
Organizational efficiency	0.447	0.807											
Economic factors	0.184	0.041	0.726										
Social factors	0.341	0.523	0.010	0.810									
Technology	0.360	0.548	0.111	0.325	0.833								
Manufactured products	0.309	0.348	0.193	0.209	0.421	0.826							
Customer	0.533	0.411	0.364	0.340	0.392	0454	0.737						
Failures	0.092	0.051	0.510	0.029	0.152	0.031	0.082	0.774					
Organizational factors	0.277	0.360	0.041	0.143	0.347	0.680	0.270	0.028	0.721				
Macro policies	0.454	0.485	0.193	0.349	0.528	0.459	0.529	0.064	0.376	0.755			
Political factors	0.003	0.005	0.109	0.256	0.002	0.256	0.180	0.039	0.071	0.087	0.877		
Industry supply chain	0.426	0.468	0.106	0.337	0.485	0.438	0.297	0.086	0.492	0.516	0.050	0.725	
Green supply chain	0.208	0.380	0.096	0.194	0.462	0.688	0.314	0.037	0.676	0.407	0.066	0.428	0.907

According to the matrix in Table 4, the AVE square root of each construct is greater than the correlation coefficients of that construct with the other ones, suggesting the acceptability of the divergent validity of the constructs.

4. Results

The relationships between the studied variables in each research hypothesis were tested based on a causal structure with the partial least squares technique. The measurement model (the relationship of each observable variable with the latent variable) and the path model (the relationship of the latent variables with each other) were calculated in the general model of the research (see Figure 2). The *t*-statistic was also calculated using the bootstrapping technique to examine the significance of the relationships (Figure 3).

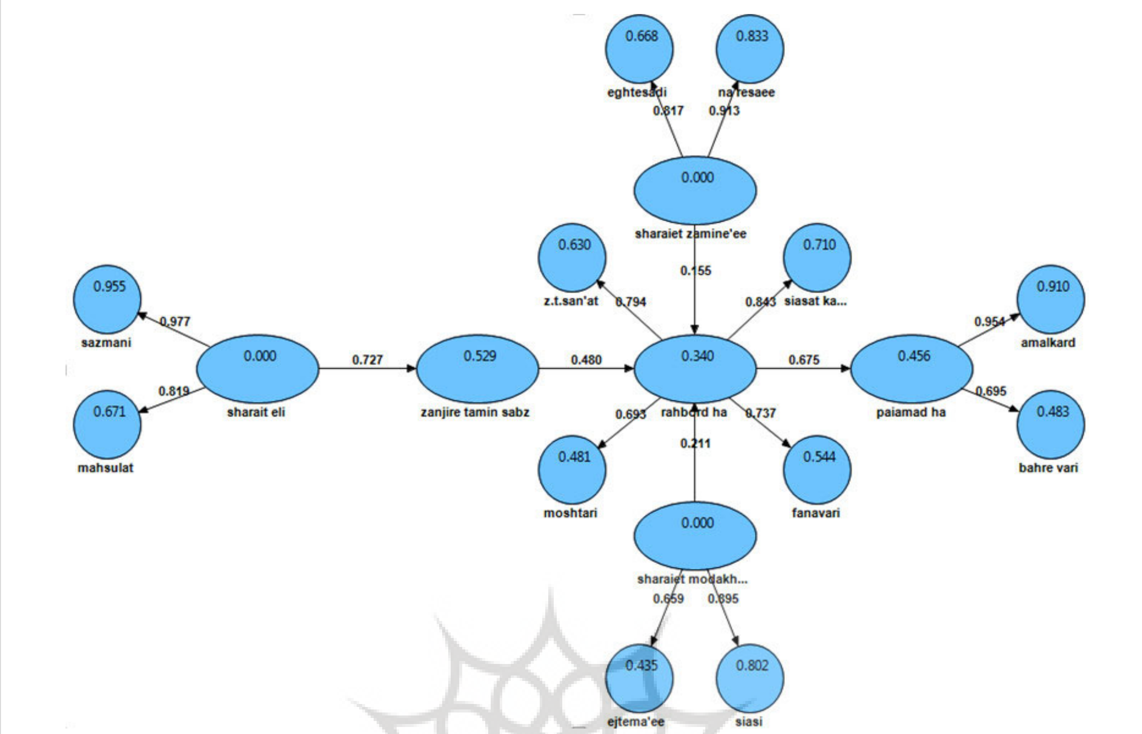

Figure 2: The partial least squares technique of the general model of research

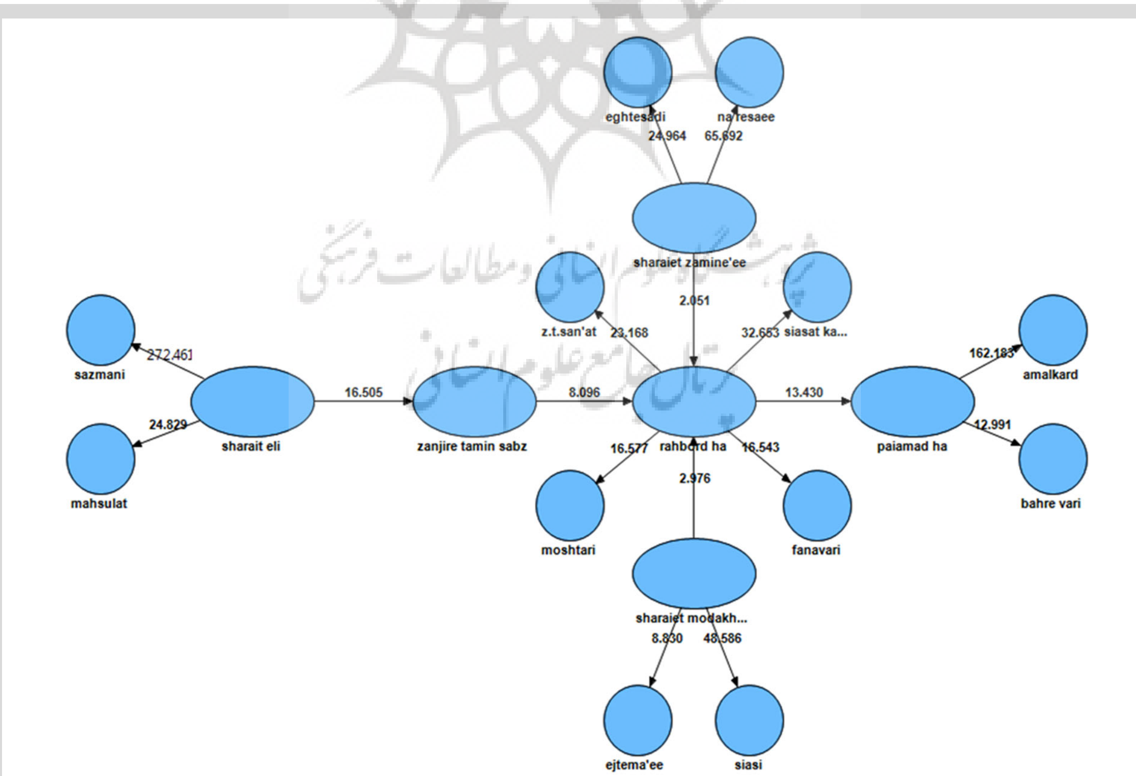

Figure 3: The *t*-statistic of the general model of research with the bootstrapping technique

Table 5: The path coefficients

Path direction	Impact	*t*-statistic
Organizational performance → Consequences	0.954	162.183
Organizational efficiency → Consequences	0.695	12.991
Technology → Strategies	0.737	16.543
Customer → Strategies	0.693	16.577
Consequences → Strategies	0.675	13.430
Macro policies → Strategies	0.843	32.653
Industry supply chain → Strategies	0.794	23.168
Social factors → Intervening conditions	0.659	8.830
Strategies → Intervening conditions	0.211	2.976
Political factors → Intervening conditions	0.895	48.586
Economic factors → Underlying conditions	0.817	24.964
Failures → Underlying conditions	0.913	65.692
Strategies → Underlying conditions	0.155	2.051
Manufactured products → Causal conditions	0.819	24.829
Organizational factors → Causal conditions	0.977	272.461
Green supply chain → Causal conditions	0.727	16.505
Strategies → Green supply chain	0.480	8.096

Evaluating the effect of causal conditions on the central category of GSC

The intensity of the effect of causal conditions on the main category of the GSC was calculated at 0.727, and the test probability statistic was 16.550, which was higher than the critical value of *t* (1.96) at the error level of 5%, implying the significance of the observed effect. Therefore, the causal conditions had a positive and significant effect on the main category of the GSC with 95% confidence.

Evaluating the effect of the central category of the GSC on strategies

The intensity of the effect of the main category of the GSC on the strategies was calculated at 0.480, and the test probability statistic was 8.096, which was higher than the critical value of *t* (1.96) at the error level of 5%, indicating the significance of the observed effect. Therefore, the main category of the GSC had a positive and significant effect on the strategies with 95% confidence.

Evaluating the effect of underlying conditions on strategies

The intensity of the effect of underlying conditions on the strategies was calculated at 0.155, and the test probability statistic was 2.051, which was higher than the critical value of *t* (1.96) at the error level of 5%, suggesting the significance of the observed effect. Therefore, underlying conditions positively and significantly affected the strategies with 95% confidence.

Evaluating the effect of intervening conditions on strategies

The intensity of the effect of intervening conditions on the strategies was calculated at 0.211, and the test probability statistic was 2.976, which was higher than the critical value of *t* (1.96) at the error level of 5%, implying the significance of the observed effect. Therefore, intervening conditions positively and significantly affected the strategies with 95% confidence.

Evaluating the effect of strategies on consequences

The intensity of the effect of strategies on the consequences was calculated at 0.675, and the test probability statistic was 13.430, which was higher than the critical value of *t* (1.96) at the error level of 5%, indicating the significance of the observed effect.

Therefore, strategies had a positive and significant effect on the consequences with 95% confidence.

In addition to displaying direct path coefficients, the Smart PLS software performs the calculations related to sub-path analysis and presents the results in a table called "General Effects". Thus, it represents the value of the general relationship and the significant level of all variables. The results of these calculations are provided in Table 6. The indirect impacts of variables on each other can also be assessed in Table 6.

Table 6: The total effects of the model

Path	Total effect	*t*-statistic
Organizational performance → Consequences	0.954	162.183
Organizational efficiency → Consequences	0.695	12.991
Organizational performance → Strategies	0.644	13.238
Organizational efficiency → Strategies	0.469	7.498
Technology → Strategies	0.737	16.543
Customer → Strategies	0.693	16.577
Consequences → Strategies	0.675	13.430
Macro policies → Strategies	0.843	32.653
Industry supply chain → Strategies	0.794	23.168
Organizational performance → Intervening conditions	0.136	2.856
Organizational efficiency → Intervening conditions	0.099	2.689
Social factors → Intervening conditions	0.659	8.830
Technology → Intervening conditions	0.155	2.972
Customer → Intervening conditions	0.146	2.826
Consequences → Intervening conditions	0.142	2.863
Strategies → Intervening conditions	0.211	2.976
Macro policies → Intervening conditions	0.178	2.953
Political factors → Intervening conditions	0.895	48.586
Industry supply chain → Intervening conditions	0.167	2.955
Organizational performance → Underlying conditions	0.100	1.997
Organizational efficiency → Underlying conditions	0.073	1.946
Economic factors → Underlying conditions	0.817	24.964
Technology → Underlying conditions	0.114	2.019
Customer → Underlying conditions	0.107	2.015
Failures → Underlying conditions	0.913	65.692
Consequences → Underlying conditions	0.105	2.004
Strategies → Underlying conditions	0.155	2.051
Macro policies → Underlying conditions	0.131	2.055
Industry supply chain → Underlying conditions	0.123	2.046
Organizational performance → Causal conditions	0.225	5.525
Organizational efficiency → Causal conditions	0.164	4.459
Technology → Causal conditions	0.258	5.495
Manufactured products → Causal conditions	0.819	24.829

Path	Total effect	*t*-statistic
Customer → Causal conditions	0.242	5.760
Consequences → Causal conditions	0.236	5.548
Strategies → Causal conditions	0.349	6.618
Organizational factors → Causal conditions	0.977	272.461
Macro policies → Causal conditions	0.294	6.055
Industry supply chain → Causal conditions	0.277	5.882
Green supply chain → Causal conditions	0.727	16.505
Organizational performance → Green supply chain	0.309	6.622
Organizational efficiency → Green supply chain	0.225	5.107
Technology → Green supply chain	0.345	6.502
Customer → Green supply chain	0.333	6.909
Consequences → Green supply chain	0.324	6.650
Strategies → Green supply chain	0.480	8.096
Macro policies → Green supply chain	0.405	7.353
Industry supply chain → Green supply chain	0.381	7.130

5. Discussion and Conclusions

The intensity of the effect of calm conditions on the strategies was calculated at 0.349, and the test probability statistic was 6.618, which was higher than the critical value of t (1.96) at the error level of 5%, implying that the observed effect was significant. Therefore, the calm conditions positively and significantly affected the strategies with 95% confidence. Similarly, the model could examine the intensity of each variable's effect.

The impact of an SSC on organizational performance and efficiency in the NISOC was evaluated in this research. Based on the results, the variables of GSC, industry supply chain, macro policies, socioeconomic factors, organizational factors, political factors, technology, manufactured products, customers, and supply chain failures affected the organizational performance and efficiency of the NISOC. SSCM was the integrating factor of the SCM with environmental requirements at all stages of the product design, product selection, supply of raw materials, production, manufacturing, distribution, transport processes, customer delivery, and recycle and reuse management after consumption to maximize the efficiency rate of energy and resources along with improving the total supply chain performance (Sarkis, 2006). The effects of products on the environment were analyzed using a holistic approach (including the analysis of the product life cycle from the beginning to the end) to examine the environmental effects of supply chain activities. In this approach, all the ecological effects (the science of habit and way of life of creatures and their interaction with the environment) of each activity were measured at different stages of the product life, such as the product concept, product design, supply of raw materials, manufacturing production, assembly, storage, packaging, transportation, and reuse of the product. They will be considered in the product design. The general idea of an SSC is to maximize profits while preventing environmental damage. The goal of SSCM was to find the balance point between profit and environmental costs in the pricing process in the relationships of the chain elements. Reducing carbon emissions during production is a topic raised in this context. Silvestre (2015) stated that supply chains in developing and emerging economies encountered more barriers than companies operating in developed countries. However, improving supply chain sustainability in developing countries brings essential values to the world due to the higher number of developing countries (Hong et al., 2018). Integrating environmental, social, and economic aspects influences general management decisions, especially SCM and operations management. Organizations have employed the supply chain approach to rethink and redefine the concept of operations management.

SSCM is defined based on integrating environmental and social goals with economic approaches compared to the traditional SCM, which emphasizes the financial and economic operations of the business. In this sense, SSCM stresses a forward supply chain and is complemented by a closed-loop supply chain (CLSC) that includes RSC, remanufacturing, and product recovery. The concerns of government, nonprofit organizations, and people, especially environmentalists, about global warming, depletion of natural resources, the use of nonrenewable resources, and the increased industrial activities in developed and emerging economic societies have led many shareholders to focus on sustainable business development. SSCM is essential in the context of organizational competitiveness in terms of price, quality, reliability, flexibility, and accountability. The following recommendations are based on the obtained results:

1. It is recommended that the organizational performance of the NISOC should be improved regarding the environment using green logistic solutions since environmental protection is currently one of the critical issues for customers, shareholders, governments, employees, and competitors, in addition to reducing pollution and production of environmentally friendly products.

2. it is recommended that the NISOC should align appropriate organizational policies and the attitudes of employees and managers in adequately implementing the SSC.

3. We suggest that an accurate, principled, and inclusive mission statement tailored to the conditions of the organization should be formulated, followed by applying the required planning and follow-ups for its proper implementation, along with the necessary corrections as needed.

4. To achieve the rule of law, appropriate laws must be developed in all sectors and communicated to all units and stakeholders. Moreover, appropriate rewards and penalties should be determined to better enforce the laws.

5. It is suggested that all units should be considered a whole through comprehensive management and the ground for coordination, and the coherence of units should be provided by holding joint meetings and coordinated planning with all units by involving all stakeholders in the procedures.

Limitations of the research

The essential bottlenecks of this study were the following:

- The negative impact of employees' job dissatisfaction on answering questions correctly and promptly.
- The volume of questionnaires and the difficulty of answering for experts
- Increased experts' errors due to the high volume of questions
- Lack of research in the field of sustainability models
- It was difficult for experts to complete the questionnaires due to their large size.
- Distribution and collection with the petroleum system facilitated the work to some extent, but the number of dimensions, components, indicators, stimuli, and obstacles made the work challenging and time-consuming.
- The problem of gaining employees' trust in answering the questions of the quantitative stage questionnaires and eliminating the sensitivity and resistance that some employees had in answering the questions were among the research challenges.

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